

Application N° 10/572,864

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Re : Following your sending dated Marc 31, 2007 :

New draft including modifications in Description, Claims, Abstract & Figures

## DESCRIPTION

### Background of the Invention

The present invention relates to an ergonomic chair system with an adjustable suspended supple seat adaptable to all users' mobility or size, equipped with a balanced, secured and controlled inclination by user' body weight only without help, effort nor notch. With the ageing of populations all over the world thanks to medical progress, appears a growing need of chairs systems especially adapted to users with reduced mobility because of age, over-weight, handicap, accidents.

The Patent to Manuel (US Pat. N°4,367,894), as others Patents for folding chair systems, describes a concept of foldable examining chair allowing a variation of the backrest and the seat but constructed from rigid and non-ergonomic planar panels, this rigid structure being quite different and less adaptable to ageing users needs (ergonomic and autonomy) as compared with the present invention.

### Summary of the Invention :

The present invention relates to a system of chair improving the precedent Patent for all users and particularly for users with reduced mobility through :

- The possible adaptation of the supple seat to the user' mobility and size, thanks to an adjustable bar fastening the lower end of the supple seat hanging on a rotating seating structure on a stable base, this adjustable bar allowing to adjust the seat tension and length by modification backward or forward of its position. For example, when set up in its most tightened position, the supple seat is stretched near vertical line in maximum tension and presented directly to the standing user, easing securely his access to the chair and conversely easing securely his exit from the chair when sitting. This adjustment system allows moreover a precise adaptation of the seating length to the user size and morphology.
- This ergonomic and comfortable supple seating, which hangs on the chair structure, holds the body user like a hammock from head to knees without angles or rigid panels, avoiding most back and buttocks numbness, stiffening or bedsores risks occurring in rigid seating structures while remaining seated or laying for a long time
- The complete, secured and variable slope of the chair from sitting to laying and all intermediate positions is autonomously controlled by the user thanks to the seating structure system balanced on the stable base by the user' body weight only without any effort, help nor notch.

Therefore, the principal object of the present invention is to provide an innovating system of chair particularly useful for users with reduced mobility thanks to its ergonomic suspended and adjustable supple seat.

Another object of the present invention is to associate the two precedent characteristics with a system of complete secured and variable slope controlled independently by the user's body weight only without any help or notch.

The system according to the present invention supplements and improves the existing systems of chairs with variable slope and will be detailed and described with the accompanying drawings as follows :

#### Description of the system

Referring to the figures 1, 2 and 3, the various processes and interactions are described as follows:

**Fig. 1 :** Side view of the chair with the adjustable supple seat stretched near vertical line in its maximum tightened position by the adjustable fastening bar set up in maximum backward position, the seat being therefore presented directly to the user standing.

**Fig. 2 :** Side view of the chair in stable seating position with the ergonomic supple seat (without rigid panels angles) supporting ergonomically the user from head to knees.

**Fig. 3 :** Side view of the chair in stable laying position, the user having naturally transferred his body weight in the supple seat backward without any development of effort or help or notch, this transfer occurring a controlled swing and a stable reclining of the whole seating structure on the stable base to the new wished position. All intermediate possible positions between sitting and laying are stable too.

In reference to these 3 figures, the major components of the present chair system will be referred in the description by the followings :

1. A supple seat (A), hanging and fastened on the seating structure in its 2 ends on 2 bars (T2, T5) . (A) is supported and sliding on two fixed bars (T1,T3) of the seating structure. Bar T2 is adjustable backward or forward and allows all adjustments of length and tension of (A) (shortening or lengthening). Seat (A) being supple and suspended on the seating structure, the user's body weight in the supple seat is always centred on (G), while seating or laying or in all intermediate positions.

2. A balanced deformable seating structure composed by 3 joined parts (B1, B2, B3), articulated between them and operating as follows:

- B1: a rigid semi parallelogram at 3 sides out of U, holding (A) on (T5), articulated at its 2 lower ends by 2 symmetrical rotation points with anti rubbing joints forming an axis (X4) and rotating on 2 parallel plans between them perpendicular to this axis on:
- B2: a rigid parallelogram at 4 sides, holding (A) on the fixed bar (T3) and on the bar (T2) adjustable on symmetrical points of fastener, B2 being articulated on B1 as

above and in 2 rotation points with anti rubbing joints forming an axis (X3), axis (X3,X4) being parallel in the same 2 preceding parallel plans on B1 and rotating on :

- B3: a rigid parallelogram at 3 sides, holding (A) on the fixed bar (T1).

B1, B2 and B3 being assembled, articulated and rotating between them, the seating structure thus made up is suspended and rotating on a stable and rigid base in 4 rotation points with anti rubbing joints symmetrical 2 by 2 forming 2 parallel axis (X1, X2), themselves parallel in X3 and X4. Are thus defined 2 symmetrical equilateral quadrilaterals (P1/P2) in 2 deformable parallel planes in rhombuses forming between them a deformable symmetrically parallelepiped centred on (G'), intersection of the axis joining its opposite tops. This centred deformable symmetrically parallelepiped being suspended and rotating on stable base (C), is balanced in its rocking around its balance point (G').

Is thus defined an axis (G, G') joining the user' body weight in the supple seat (G) previously defined and the balance point (G) of the seating structure holding the supple seat. The process of alignment of those 2 points creating this axis drives an automatic interaction between those 2 points, any modification of the position of G involving an inverse modification of the position of G', thus a deformation of the suspended seating structure and the slope of the supple seat controlled by the user' body weight.

3. a stable and rigid base (C) resting on the ground, constituted by non deformable symmetrical elements forming mounting and balustrades (F), integrating 2 stops of safety (S) controlling securely the maximum rocking of seating structure backward and forward.

#### Operating of the system

Considering Fig. 1 & 2, the present invention describes an adaptable system of seat to the user's mobility and morphology thanks to the possible adjustment of the tension and length of the supple seat :

- Adaptation of the seat to user' mobility, easing the user' access and exit of the chair by adjustment of the seat tension : this process is based on the suppleness of the seat (A), hanging as a hammock on its 2 ends on bars (T5, T2) of the seating structure (B1, B2, B3) and sliding above bars (T1, T3) as intermediate supports for user' knees and ankles. As shown on Fig 1, the maximal backward retreat of adjustable bar T2 on maximum fastening point on the seating structure pulls backward the supple seat (A) on its lowest end, the occurred stretching of the seat, fixed on its upper end on bar T5, pulls the upper end of the seat on T5 and bends over the whole deformable seating structure rotating freely on the stable base (C) along axis (X1, X2).

The supple seat, stretched on seating structure itself bended forward on stable base, is presented near vertical line to the user standing in front of the chair, easing and helping its access or conversely its exit without development of effort or risk of fall when seating or standing for users with reduced mobility.

- Adaptation of the seat to user' morphology by adjustment of the seat length : complementary to the precedent action, this same system of adjustment of bar T2 regulating the supple seat (A) tension allows too as shown in Fig. 2 all intermediate adjustments of T2 position backward or forward on existing fastening points on the seating structure, these intermediate adjustments shortening or lengthening the supple (A) by the same precedent process according to the size and the morphology user of the user sitting in the chair and allowing a personalization of the chair to each user.

**Considering Fig. 2 & 3**, the present invention describes an ergonomic system of seat thanks to the supple hanged seat bringing to all users and especially to users with reduced mobility a relaxing and releasing support of the whole body and avoiding main numbness or stiffening risks whatever chosen position

- Relaxing and releasing support of the whole body of the user : This process is based on the ergonomic of the seat (A), self adapting to the shape of the body of all users thanks to its supple material. The supple seat (A), as shown on Fig. 2 & 3, is hanging on its 2 ends like a hammock on seating structure and hold intermediately under knees and ankles . This supple seat (A) supports and distributes lightly the whole body weight of the user on its total surface. The whole body of the user is thus permanently and ergonomically held up from head to ankles in all positions in the chair sitting or laying, allowing a real relaxation and wellness to reduced mobility users and consequently to all users.

- Reduced numbness or stiffening problems : the ergonomically seat (A), as described in the precedent process and shown in Fig. 1 & 2, is made up with a supple basis all in one piece, without any rigid planar panel supporting back or buttocks of the user . The whole user' body weight is settled down from head to knees without any angles, avoiding main numbness, stiffening or bedsores risks occurring in main rigid structures with panels and angles, when motionless users or reduced mobility users remain .seating or lying for a long time.

**Considering Fig. 2 & 3**, the present invention describes a balanced system of seating system, allowing a independent complete, secured and variable slope for the user, without help of effort, thanks to the deformable seating structure rotating and balancing on the stable base controlled by the user' body weight only and to the security stops controlling the maximum rocking of the seating structure backward and forward.

- Independent, complete and variable slope of the seat controlled by the user' body weight only: as previously defined, the seating structure holding the supple seat where the user and rotating on the stable base © is centred around an axis (G, G') joining the user' body weight in the supple seat (G) and the balance point (G) of the seating structure holding the supple seat. The process of alignment of those 2 points creating this axis drives an automatic interaction between those 2 points, any modification of the position of G involving an inverse modification of the position of G', thus a deformation of the suspended seating structure, the slope of the supple seat being thus controlled by the user' body weight (G) only.

The user can independently choose, reach and keep all positions in the chair system, from sitting to laying and intermediate. All reached positions are stable and do not require any effort to be maintained. This process is especially adapted to users with reduced mobility, avoiding them any development of effort or help to modify their own position in the chair from sitting to laying and bringing them a great independence of movement while being in the chair.

- Secured slope of the seat in maximum rocking backward or forward :the precedent process of independent rocking of the seat is secured in its maximum backward or forward slope thanks to 2 safety stops (S) fixed on the stable base ©, the seating structure and the user being stopped in maximum front and back security positions without risk of inversion or fall.

**Constants and constraints to be respected in the application of this system :**

Independently of the form of this structure, the only 2 geometrical constants to be respected are :

- a) an approximate equidistance between the rotation axis (X1, X2, X3, X4
- b) a height of the axes X1 and X2 from the ground upper than the height of 2 quadrilaterals P1/P2, to allow the free suspension of the seating structure on the stable base and its free rocking without friction on the ground.

Material constraints :

The present system of chair can be declined in all usual materials for furnishing as metal, wood, composite or different matters and in varied forms of structure (round, angular,...), thus not being subjected to phenomena of mode and can be declined in medical sectors such as ageing, handicap, over weight as well as all economic sectors requiring solid and comfortable furniture (thalassotherapy, hotel facilities,...)